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Directory of Industry and University Collaborations with a Focus on Software Engineering Education

Maribeth B. Carpenter

March 1995

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Maribeth B. Carpenter

Maturing the Profession of Software Engineering

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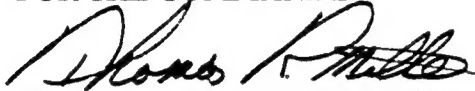
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The ideas and findings in this report should not be construed as an official DoD position. It is published in the interest of scientific and technical information exchange.

Review and Approval

This report has been reviewed and is approved for publication.

FOR THE COMMANDER

Thomas R. Miller, Lt Col, USAF
SEI Joint Program Office

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Directory of Industry and University Collaborations with a Focus on Software Engineering Education

Abstract: This directory describes collaborative efforts among businesses and universities in the United States and Canada to promote software engineering education. The groups vary in their maturity and the services provided. This directory points organizations toward collaborations within their geographic area.

Introduction

This directory contains information on collaborative efforts to promote software engineering education, usually within a specific geographic area. It allows the reader to locate an existing group with which to interact, as a potential member, supporting university, or commercial provider of educational services. The directory provides brief descriptions of currently identified collaborations. It is expected that the directory will grow as more such collaborations are formed.

The groups described vary in their maturity and in the type of services they provide. Some groups merely share information and experience; others offer software engineering classes to members and non-members for a fee. Obtaining cost-effective education designed to specification and delivered locally is often difficult for a single organization, but when organizations pool resources and share classroom seats, costs go down. A nearby university typically serves as the group facilitator and coordinates class offerings. These offerings may be selected by a refereed process from course proposals solicited from educational vendors.

For a software organization, the directory provides an awareness of geographically convenient collaborations. If none is available locally, the descriptions of existing collaborations may serve as a model for the formation of a local group. The more mature groups are serving as models to emerging groups, providing examples of organization structure, charters, fee arrangements, and other pertinent information.

For colleges and universities, the directory highlights a potential business opportunity and a way to become more involved in the local industrial community. The points of contact from universities are experts in techniques for organizing local efforts.

For educational providers, the directory can point to new potential client bases.

A short list of references is provided to point the reader to background material on software engineering curricula, training needs for organizations embarked on software process improvement efforts, Software Process Improvement Networks (SPINs), and the Software Engineering Institute (SEI) capability maturity model (CMM) and its key process areas (KPAs). These topics are relevant to the discussion of the goals of the collaborations.

Geographical Data

The following lists indicate by state where the university/industry collaborations described in this directory are located.

California

District of Columbia

Florida

New York

Saskatchewan Canada

Texas

Alliance for Higher Education

The Alliance for Higher Education creates partnerships between academic and corporate communities to respond to the educational demands of business, industry, and government and to facilitate cooperative activities. It began its mission in 1967 with The Association for Graduate Education and Research (TAGER) television network, which brings higher education to the workplace. The Dallas chapter of the Software Process Improvement Network (SPIN), in conjunction with the Association for Software Engineering Excellence (ASEE), is working to provide software engineering education over the TAGER network.

Organization

The Alliance for Higher Education is a not-for-profit, non-government agency. It is directed by a Board of Trustees. Presidents and chancellors of member academic institutions provide direction through the Council of Presidents.

Membership

There are 3 categories of membership:

1. Principal participants are colleges and universities, currently numbering about 25.

2. Associate participants are institutions, agencies, or companies that are substantial users of Alliance services.

3. Service subscribers participate in Alliance services.

All membership categories have a membership approval process. There is a fee structure for membership.

Course Acquisition

Influenced by both the Dallas SPIN and SEI curriculum guidelines, Southern Methodist University, Texas Christian University, and The University of Texas at Arlington offered graduate courses in software engineering over the TAGER network in the fall of 1993. The Alliance produces a course catalog.

Point of Contact for Further Information

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California State University, Long Beach Software Engineering Forum for Training

Formed in September 1993, the California State University, Long Beach (CSULB) Software Engineering Forum for Training (SEFT) is a training partnership among companies in the Long Beach, Los Angeles, and Orange County areas. CSULB SEFT provides high-quality, cost-effective, tailored training in software engineering process improvement and management practices to employees of member companies. Membership in the consortium provides the opportunity to influence and guide the training curriculum, and membership fees are applied directly to the training that companies receive.

Organization

SEFT has an advisory Executive Board and a Technical Committee composed of member and CSULB representatives. The Executive Board is the policy-making body, and the Technical Committee develops curricula and assists the Board. SEFT is administered by the Division of Professional Development, University College and Extension Services, and has a charter and documented operating plan.

Membership

Members of SEFT include McDonnell Douglas, Northrop Grumman Corporation, and TRW. Funding of SEFT is provided through the sale of annual memberships. Members have seats on the Executive Board and the Technical Committee, priority access to training at a reduced cost, direct input into the selection of course topics and curriculum, and discounts on selected non-credit University College and Extension Services courses.

Course Acquisition

Following a thorough needs assessment, course topics are identified, and detailed course outlines are written. Potential instructors and faculty are solicited to begin customization of courses. SEFT has access to an in-house training consultant for curriculum design and development.

Several courses have been delivered. Subject areas include Software Configuration Management, Software Metrics, Software Testing, Software Risk Analysis and Management, and topics related to software process improvement. Courses are open to the public when space is available. CSULB SEFT has extensive mechanisms, such as videoconferencing, for delivering distance education.

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Computer Applications and Software Engineering (CASE) Center

The Computer Applications and Software Engineering (CASE) Center at Syracuse University is one of New York State's original Centers for Advanced Technology (CATs). Initiated in 1983, the CAT program represents a creative partnership among universities, industry, and government designed to accelerate the development of commercially relevant technologies. Key goals are increased industrial productivity, a strengthened technological infrastructure, and more effective technology transfer — all helping to spur economic growth.

Organization

The CASE Center is managed by its director, Bruce Berra, and its research director, Robert Birge. Faculty researchers, university administrators, and CASE staff assist the directors with industrial liaison, technology transfer, and outreach programs. More than 60 faculty members from a dozen academic departments and campus organizations are affiliated with the Center. The CASE Center's research program operates several specialized laboratories, among them the Software Engineering Laboratory, charged with developing tools and methods for improving the quality of computer software. Areas of research specialty include object-oriented software engineering, techniques for software data analysis, distributed object systems, trusted systems, neural networks, and associative processing. Research results are disseminated through conferences, workshops, seminars, demonstrations and special events. Publications include technical reports, a newsletter, and informational materials.

Membership

In addition to federal funding and seed funding from the New York State Science and Technology Foundation, the CASE Center has received funding from approximately 100 companies, universities, and government organizations operating within New York. The Center conducts joint research with industry and other outside sponsors. Through the Industrial Membership Program, partners receive invitations to workshops and conferences, special assistance, and representation on an advisory board. The Center also provides technical consulting, access to computer facilities and special information systems, laboratory interactions and specific technical services.

Course Acquisition

The CASE Center offers a variety of educational opportunities for both college students and corporate personnel. Laboratories provide hands-on training and practical applications of theoretical concepts.

Point of Contact for Further Information

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DC SPIN Training Group

The Washington, DC, Software Process Improvement Network (SPIN) started a training group in early 1993. This special interest group meets monthly, usually the third Wednesday night of the month, from 7-8 p.m., followed by a half hour informal networking session.

Organization

The DC SPIN Training Group has drafted a charter that includes both training and education goals. At the moment, the organization is run by a loose association of volunteers. Meetings usually feature speakers who share information about their organizations' training programs, recap pertinent presentations from national conferences, or describe available training.

Membership

Members are drawn from the DC SPIN. There are approximately 55 members. Attendance at meetings ranges from 10 to 15 people. Individuals may request that they be added to the training group mailing list to receive announcements and minutes of meetings.

Course Acquisition

To date, the DC SPIN Training Group has not acquired any classes for its members. It did, however, provide students for a pilot offering of an SEI course.

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Florida Atlantic University

The Florida Atlantic University (FAU) Computer Science and Engineering (CS&E) Department and members of its Industry Advisory Committee recognized a need to establish an extensive graduate education effort in software engineering. Through a combination of SEI-produced video presentations and FAU-produced live lectures, a series of 6 graduate-level software engineering courses was offered consecutively at 6 university and industry sites in southeast Florida during 1990 and 1991, and in a limited fashion until April 1993. The courses were fully funded by the participating industries. On January 16, 1992, 59 students were awarded certificates in software engineering for successfully completing at least 5 of the 6 courses. By the spring of 1993 term, over 250 students had taken at least one course.

Since this successful program, FAU has expanded its internal offerings through the state-wide Florida Engineering Educational Delivery System (FEEDS). Through FEEDS, courses are offered by videotape and live broadcast, and in standard lecture format to subscribing sites and on-campus students.

Organization

The FAU CS&E Department formed an Industry Advisory Committee to help the department identify and meet the needs of the large computing-based industry in southeast Florida. During the advisory committee's initial meetings, the need for extensive graduate software engineering courses for employees quickly emerged as the top issue. While FAU offered software engineering courses as part of its graduate programs, it was not prepared to offer the variety and number of courses that were needed immediately without more financial assistance and faculty. FAU contracted with the SEI to obtain a set of video-based courses, to be delivered by FAU faculty.

Membership

Nine research and development firms having headquarters or major plants in southeast Florida were invited to join the FAU CS&E Department Industry Advisory Committee: Bendix King, Encore Computer Corporation, Harris, IBM, Modular Computer Systems, Motorola, Siemens Stronberg-Carlson, Racal-Milgo, and United Technologies. These companies fully funded the courses taught between 1990 and 1993 in the graduate software engineering education program.

Course Acquisition

The courses taught between 1990 and 1993 in association with the SEI were Software Project Management, Software Verification and Validation, Software Design, Software Creation and Maintenance, Software Specification, and Software Systems.

During the 1994-95 academic year, FAU offered courses in Object-Oriented Software Design, Software Engineering Measurements, Software Engineering (a survey), and Advanced Object-Oriented Software to employees at industries including Harris, IBM, Motorola, Racal-Milgo, and Siemens, as well as to on-campus students.

The FAU CS&E Department is in the final stages of approving a Software Engineering option within its existing master's program. A separate Master of Software Engineering (MSE) program may be proposed within 2 years.

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Research Institute for Computing and Information Systems (RICIS)

The mission of RICIS is to conduct, coordinate, and disseminate research in computing and information systems to serve the needs of government, academia, industry, and community. Emphasized research areas include software reuse, group decision support methodology, mission- and safety-critical systems, and medical imaging. New projects are being formed in digital libraries, environmental computing, and network information resources. Special emphasis is placed on design and execution of symposia, projects, and interchanges to facilitate technology transfer among RICIS participants.

Organization

The University of Houston at Clear Lake (UHCL) established RICIS in 1986 to encourage the NASA Johnson Space Center (JSC) and local industry to actively support research in computing and information systems. A cooperative agreement between UHCL and NASA/JSC provides for sharing of personnel, and computing and educational facilities. The RICIS Program Office, within the UHCL Provost Office, manages funding from various sources, primarily from NASA under the cooperative agreement. The overall organization is that of collaborative projects within the above broad research areas.

Membership

RICIS encourages faculty participation across UHCL schools: Natural and Applied Sciences, Business and Public Administration, Human Sciences and Humanities, and Education. An Industrial Affiliates program involves local companies (led by Rockwell, Lockheed, UNISYS, McDonnell Douglas, Loral/IBM, and Texaco) in defining research problems in systems engineering and project management. A gateway concept expands the local expertise on targeted problems to include vendors, other universities, and other research organizations. Fees are charged only for direct participation in projects.

Course Acquisition

Courses and special events are organized in conjunction with the UHCL Professional and Continuing Education unit. A Master of Software Engineering degree program is offered within the Computer Science Program. Related programs are available in business administration, futures studies, and instructional technology, among others. Further description of the Institute, its research areas, and the Master of Software Engineering Program are available on Internet/World Wide Web at http://rbse.jsc.nasa.gov.

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San Diego State University
Software Engineering Forum

The San Diego State University (SDSU) Software Engineering Forum (SEF) is a partnership of San Diego industry, corporations, interested government organizations, and SDSU. The Forum is a self-supporting unit that draws on existing activities and resources provided by local business, government, and SDSU. The Software Engineering Forum promotes high quality, cost-effective training in Software Engineering and management practices. The purpose of this training is to empower members to build and implement a process infrastructure for effective Software Engineering and management practices to support the goal of achieving higher software process maturity levels as defined by the Software Engineering Institute (SEI) of Carnegie Mellon University (from the SEF Handbook, January 25, 1993).

Organization

The SEF has an advisory Executive Board composed of member and SDSU representatives. The SEF Technical Steering Committee, through subcommittees, manages the activities that meet the technical needs of the SEF, such as curriculum development and course selection. The SEF Director is part of SDSU Professional Development, College of Extended Studies. The SEF has a charter and documented operating plan.

Membership

Thirteen companies are currently enrolled in SEF. Most are Department of Defense contractors, some large, some small. Funding of SEF is provided through the sale of annual memberships. The level of membership determines the membership fee and the annual seat allocation in SEF course offerings.

Course Acquisition

Following a curriculum needs assessment, seminar topics are selected, and course descriptions are written. Proposals are solicited from potential instructors. Since 1992, 30 courses have been delivered. Courses are open to non-members for a fee.

Point of Contact for Further Information

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Software Industry Coalition

Established in the spring of 1993, the Software Industry Coalition is a non-profit, mutual benefit corporation dedicated to improving the effectiveness of the software industry's relationships, workforce, processes, and products. The Coalition's mission is to identify significant software industry issues, act as a catalyst in resolving those issues, and present a coordinated industry voice.

Organization

The Software Industry Coalition is led by its Board of Directors, which is composed of member representatives. It is managed by a small executive staff. The Board of Directors, executive staff, and general membership select the issues and projects to be undertaken for the benefit of the members and the software industry. For example:

- The Employee Retraining Project assists member companies in obtaining and maintaining the skilled workers they need. This project is funded, in part, from a State of California grant that reimburses member companies for a substantial portion of their training and administrative expenses.
- The Coalition has researched and published the Software Creator's Profiler as a tool for managers, human resources professionals, and software professionals to assess the skills and training requirements for any software creator's job. This is an ongoing project examining the underlying skills required of software creators.
- The Software Education Project matches member company requirements to the best sources of training, delivery methods, and schedules.
- The Intellectual Property Committee provides forums to educate members on the consequences of legislative activity and assist in developing a consensus on the issues.

Membership

Members reflect the diversity of the software industry: independent software vendors, government laboratories, universities and colleges, and computer manufacturers. Membership fees support the work of the projects.

Course Acquisition

In collaboration with universities, consultants, and corporate education teams, the Coalition develops focused, timely, and effective technical education and training programs that ensure implementation of sound product development and management processes. Success is measured in part by the development and delivery of multiple workshops, courses, and curricula to meet the identified needs of the industry on an on-going basis.

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Software Quality Institute

The Software Quality Institute (SQI) is a multidisciplinary partnership between The University of Texas at Austin and the software and information systems organizations in Texas. Its mission is to inform and educate software producers and software users at the local, state, and national levels about issues vital to the production and application of high-quality software. SQI draws upon the wealth of research and expertise available at UT-Austin as well as from a large pool of outstanding talent from industry and government.

Organization

SQI is guided by an advisory group of 28 representatives from industry and government who assure that SQI's activities meet industry needs, including program development and curriculum selection. Subcommittees oversee other SQI activities, which include publication of Software Quality Matters, a quarterly newsletter; Austin Software Executives' Group (ASEG), which brings together key executives to discuss business issues; and the Austin Software Process Improvement Network (A-SPIN), which sponsors monthly meetings for developers and managers.

Membership

SQI is a resource recovery program that receives funding from registration fees, individual memberships, corporate support, and subscriptions. Training is offered through public programs as well as courses that are taught on-site. Programs currently underway include a 13-month Software Project Management Certificate Program, one- and two-day seminars, and a series of half-day presentations for executives with oversight responsibility for managing software divisions.

Course Acquisition

SQI's programs are offered to professionals on a non-credit basis and topics are selected according to assessments. Proposals are solicited from potential instructors. Subject areas include software project management, risk management, in-process inspections, testing, human-computer interfaces, process, configuration management, and related topics.

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Software Technology Centre

The Software Technology Centre (STC) is an industry-led, strategic alliance with post-secondary educational institutions and the Saskatchewan and Canadian governments. Established in December 1993, the STC is a not-for-profit corporation, whose mission is "to assist the software community to be globally competitive" with the goal of stimulating the development of a strong private sector. To fulfill this mission and to meet members' and stakeholders' needs, the STC offers services in professional development, information collection and dissemination, and strategic development. The STC's services complement, not compete with, industry.

The STC's goal is to become an internationally recognized information technology centre. It acts as a catalyst to assist members and stakeholders in global competitiveness; to deliver quality services to meet customers' evolving needs; to advocate the value of information technology; and to transfer world-class, state-of-the-art information technology knowledge, including software engineering principles and practices, to other economic sectors.

Organization

The STC is led by a Board of Directors that is chaired and controlled by industry; universities and governments have seats on the Board. Some notable Canadian and U.S. founding members of the STC are Information Systems Management (ISM) Corporation, CDSL Canada, Saskatchewan Telecommunications, SED Systems, and TRW. They are joined by a number of other member companies, including over 50 smaller firms who joined as a group under the Software Development Association of Saskatchewan; by over 300 information technology practitioners in the Saskatchewan chapters of the Canadian Information Processing Society; and by the Universities of Regina and Saskatchewan. The STC also has a number of Canadian and international strategic alliances to provide access to state-of-the-art technologies and methodologies. For example, the STC is a member of the Software Process Improvement and Capability Determination (SPICE) program and will coordinate the SPICE trials conducted in the Canadian Prairie region.

The Centre consists of a small professional staff, supplemented by staff from the private sector and educational institutions, as appropriate.

Membership

Annual membership fees entitle members to directly influence STC strategy, to receive discounts on services, and to benefit from synergy with other members. Members are always given priority access to services. Close, on-going dialogue with members and clients is a key element in the STC's operations. These exchanges help the STC define its current and planned service offerings and to ensure that the STC continually meets the emerging needs of the software and information technology community.

Course Acquisition

The STC's professional development programs emphasize solutions to the unique needs of two major organizational groups: MIS/in-house organizations in both the private and the public sector and small-to-medium enterprises who are primarily software developers and system providers. The STC chooses its courses using the guidance of an advisory committee drawn from the software community. Key programs to be offered in 1995 include courses on executive-level awareness, software engineering, object-oriented methodologies, databases, and client-server networks. The STC is committed to the effective development and use of "distance training" technologies and methodologies.

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University of Southern California Center for Software Engineering

The University of Southern California (USC) Center for Software Engineering (CSE) has been formed to develop more mature software engineering organizations to meet the demand for complex software systems of the future. "Its bottom-line objective is to improve the long-range state of software engineering practice by catalyzing a new generation of software engineering courseware and delivery capabilities. Its 10-year strategy for achieving this objective involves a combination of sustained programs in software engineering education, research, and technology transition" (from the Prospectus for the USC Center for Software Engineering Affiliates' Program, December 1992).

Organization

The USC CSE takes a multifaceted approach to improving the state of software engineering practice. It performs necessary gap-filling research in such areas as knowledge-based software engineering, environments, processes, architectures, and economics. In the fall of 1993, it initiated an MS in Computer Science with a software engineering specialization. It has plans to develop textbooks, videos, computer models, games, tools, exercises, and role-model artifacts for training the next generation of software engineers. The USC Center for Software Engineering has an affiliates program with an active Affiliates' Steering Committee. The CSE Director is part of the USC Computer Science Department; the Center principals include USC professors in electrical engineering and business, and professors at the USC Information Sciences Institute.

Membership

Industry and government affiliates are a key aspect of the CSE. Through payment of an annual membership fee, affiliates acquire a seat on the Center Affiliates' Steering Committee. Center personnel provide an annual one-day visit to the affiliate organization, involving a professor and an agenda of the affiliate's choice. Affiliates participate in focused workshops, executive software seminars, and an annual software engineering conference and monthly Software Process Improvement Network (SPIN) meetings in collaboration with University of California Irvine. Affiliates receive prototype tools for experimentation, technical reports, and exploratory videos and courseware. There are currently 25 affiliate organizations.

Course Acquisition

While the Center does not produce courses specifically for affiliates, member organizations benefit from annual one-day USC professor lectures and visits to the affiliate's organization. Periodic focused workshops provide the opportunity for technical interchange among professors, researchers, and practitioners. Most of the software engineering MS courses are offered

on a regional interactive television network; some of the courses are also offered nationally by the National Technological University.

Point of Contact for Further Information

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                  Notes in Computer Science (536), (J. E. Tomayko, Ed.). *Proceedings of
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                 Institute, Carnegie Mellon University, 1993.

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                 Mellon University, 1991.

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FIELD	GROUP	SUB. GR.	collaboration software engineering education
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			industry software process improvement network (SPIN)
			university

19. ABSTRACT (continue on reverse if necessary and identify by block number)

This directory describes collaborative efforts among businesses and universities in the United States and Canada to promote software engineering education. The groups vary in their maturity and the services provided. This directory points organizations towards collaborations within their geographic area.

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